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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3[illegible]

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Address By
James E. Webb, Administrator
National Aeronautics and Space Administration
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It is a real pleasure for me to be able to talk to a group of fellow members of the bar about our nation's space program. And this group, I realize, has more than the average interest of the legal profession in governmental matters, since each of you is either now or has been a lawyer responsible for counseling or representing the Government in some capacity.

Before discussing what we are doing in space and why we are doing it, I want to say a few words about the agency which I am presently heading. The National Aeronautics and Space Administration was established on October 1, 1958, pursuant to an act of Congress, the National Aeronautics and Space Act of 1958. The legislative history of the Act

makes it abundantly clear that a prime motive for NASA's establishment was to emphasize to the world this nation's concern for developing and promoting the peaceful uses of space. The Act commences by stating that "it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind." It then goes on to establish a new civilian agency, NASA, totally outside the Department of Defense and answerable directly to the President. Under the Act, NASA is responsible for all of the nation's space exploration activities, except those which are "peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States," which remain the responsibility of the Department of Defense.

The Act specifically directs NASA to conduct such activities "as may be required for the exploration of space." This is a mission virtually as boundless as space itself. One of the most striking things about the space business is the tremendous variety of activities which it already includes. In looking at our space program, it is useful, I think, to divide it into three main categories: First, the conduct of scientific investigations in space by

means of unmanned spacecraft to increase our basic scientific knowledge. Second, the development of practical applications of space technology for the economic benefit of mankind. And finally, the exploration of space by man himself.

Up to the present time, the first of these areas, the space science program, has been responsible for the greater portion of our launchings. It has been a remarkably successful program, far overshadowing in scientific output the efforts of the Soviet Union. In a report to Congress earlier this year, NASA noted that nearly all of the highly original work that has been done in space research to date has come out of the United States program.

The space science program is, for the most part, carried out with satellites, space probes, and sounding rockets. Since January 31, 1958, the United States has successfully launched 46 earth satellites, two solar satellites, and two deep space probes. The most recent is Explorer XII, which is making simultaneous measurements of many aspects of the space environment at altitudes of between 200 and 50,000 miles. All have provided important new scientific knowledge contributing to the technology

needed for more advanced spacecraft to come. The flights of these experiments have been traced by tracking stations abroad as well as by those located in the United States. Foreign scientists have participated to varying degrees in most of the experiments.

Some of the scientific findings have been:

...Discovery of two intense radiation zones trapped around the earth -- the Van Allen Belts.

...Determination that the earth is slightly pear-shaped with the stem at the North Pole.

...New data regarding the makeup of the fields of magnetism in space. For example, Explorer X transmitted highly meaningful information indicating that part of the interplanetary magnetic field near the earth may be carried earthward by energy bursts from the sun known as solar winds.

...Discovery that sunlight exerts pressure on objects in space.

Among NASA's most successful experiments to date have been the Pioneer series of space probes. Pioneer V, for example -- launched into solar orbit on March 11 last year -- was traced into space to a distance of 22.5 million

miles, still the greatest distance any man-made object has been tracked.

Advanced launch vehicles are becoming available which will have greatly improved load-carrying capability for unmanned space experiments such as Ranger, which will land instruments on the moon, and Surveyor, a spacecraft that will be able to make a so-called "soft landing" on the moon with more delicate scientific instruments. Also under development are spacecraft that will fly close to Venus and Mars.

When we turn to the field of practical applications of space technology, we already see the promise of very large, early dividends in improved communications and weather-forecasting services.

NASA's Echo I passive communications satellite, launched in 1960, has been seen by millions of people throughout the world. The huge, aluminized plastic sphere proved that it is possible to communicate between distant areas on the earth by reflecting radio signals from a satellite.

NASA's TIROS series of satellites has demonstrated the possibilities of vastly more accurate and longer-range

weather forecasting. TIROS I transmitted nearly 23,000 television pictures of the earth's cloud patterns. TIROS II, launched last November, has transmitted more than 40,000 pictures and has reported important information about the atmosphere and the radiation of solar heat back from the earth.

TIROS III pictures of Storm Eliza in the Pacific and Hurricanes Anna, Betsy, and Carla on the Atlantic and Gulf Coasts were valuable aids to the Weather Bureau in tracking these cyclonic winds and issuing warnings. NASA also used TIROS III for weather support of Astronaut Grissom's July 21 Mercury suborbital flight.

Although the United States has excelled in the fields of space science and the development of practical applications of space technology, it is manned space flight, the third category in our program, which undoubtedly will continue to occupy the center of the stage so far as public attention is concerned. It is by our progress in this field, above all, that we will be judged in the coming years.

The recent suborbital flights of American Astronauts Alan Shepard and Virgil Grissom on May 5 and July 21 were

important steps in Project Mercury, the first phase in the United States program for manned space flight. The flights were made to test the man and the Mercury spacecraft, and to determine the quality of the vehicle and its systems and man's ability to handle them in space, as preliminary steps to putting an astronaut in orbit around the earth.

The second phase of our manned space flight program is Project Apollo, whose ultimate goal is a manned lunar landing. The Apollo spacecraft will be large enough for living and working quarters to accommodate three men, who will be able to operate in a "shirt-sleeves" environment.

Apollo will first be placed into an earth orbit by the Saturn launch vehicle, which has an eight-cluster first stage with a thrust of 1,500,000 pounds. After the Apollo spacecraft is used as a manned earth-satellite laboratory, it will be sent on voyages deeper into space. These will include a three-man expedition around the moon and finally an actual moon landing and return late in this decade. The Saturn launch vehicle, which is now under development, will not be powerful enough for circumlunar flight and lunar landing. To do this job, NASA is

developing much larger launch vehicles, such as the Nova, which will be able to deliver multi-million-pound thrusts.

Our long-range plans for exploration of the moon by man are the very heart of our total effort and, more than any other single factor, determine the form, the dimensions, and the cost of our national space program.

As you know, President Kennedy, in his State of the Union message last May 25, challenged the American people to achieve world leadership in the exploration of space. The President said: "Now it is time to act, to take longer strides -- time for a great new American enterprise -- time for this nation to take a clearly leading role in space achievement." And then the President proposed that we direct our efforts toward a specific goal with a definite timetable in these words: "I believe that the nation should commit itself to achieving the goal, before the decade is out, of landing a man on the moon and returning him safely to earth."

Today, as the result of both Executive and Congressional action and the enthusiastic response of the American people, we are on our way toward the realization of this new national goal of a round trip to the moon before the

end of the 1960's. This goal is by no means the ultimate objective of our space efforts. That objective, as the President made clear, is nothing less than overall leadership, across-the-board, in the exploration of space and its utilization for peaceful purposes. But the immediate goal of sending a man to the moon and returning him safely to earth before the end of this decade is tangible evidence that we intend to achieve the ultimate objective as rapidly as we possibly can.

A number of factors contributed to the decision to select the manned lunar expedition as the dominant goal of space exploration for this decade.

In the first place, landing on the moon is the natural and logical and, indeed, the inevitable next step in manned space exploration after orbital flight about the earth. I am not overlooking, of course, the fact that man must first make journeys to the vicinity of the moon and engage in flights around it, but these are only preliminary phases of the total operation designed to enable man to explore the surface of the moon in person. From the beginning of our national space effort, there has never been any doubt about this fact. All of our work in the field

of manned space flight has pointed toward the landing of men on the moon with the ability to return to earth. The only question has been when.

In the second place, it is a task which we now have every reason to believe can be undertaken successfully before this decade is out if we are willing to marshal our scientific and technological resources in a great national effort. While there are tremendous, and fascinating, problems to be solved, our scientists and engineers tell us that they see no technical reasons today why it cannot be done if they are given all-out support.

This brings us to the third consideration: How important is it for us, as a nation, to do this thing in the shortest possible time, recognizing that if we don't make the effort the Soviet Union undoubtedly will achieve this most impressive of all space exploration "firsts." There is only one answer that the American people can give to such a question. Science and technology are rightly regarded by the world's peoples today as the keys to economic progress and military strength. At this time in history, space exploration dramatizes, more effectively than anything else can do, the forward march of science

and technology. In the minds of millions, space achievements have become today's symbol of tomorrow's scientific and technical supremacy. The Soviet Union has recognized this and capitalized on it in the cold war competition for the minds of men. We cannot afford to yield to them by default the next great prize in this competition. What we can do, we must do. When we can win, we must win.

Finally, of course, the choice of this goal depended upon a judgment concerning our relative position vis-a-vis the Soviet Union and our chances of winning such a competition. We want to be first; and if there were not a good chance of being first, the whole enterprise would take on a different hue. It is the combined judgment of those responsible for this decision that we are not under any overall disadvantage as we set our sights on sending men on a round trip to the moon at the earliest possible date. The only area of space technology in which the Soviet Union presently excels us is launch vehicle propulsion. In the next two years, however, we expect to produce in our Saturn program launch vehicles far exceeding in power anything the Soviets have demonstrated

to date. This is not to suggest, of course, that the Soviets will stand still, but it does mean that the whole field of rocket propulsion is going to be moving during the coming years at a pace which makes the present situation rather meaningless as an indication of end-of-the-decade accomplishments. Both the Soviet Union and ourselves must develop propulsion systems vastly different from anything in our inventories today in order to undertake manned expeditions to the moon. And in all other areas of space technology, we believe that we are at least equal to the Soviet Union. The manned lunar mission will require scientific and technical advances all down the line; and it will involve the most complex interaction of an infinite variety of systems, drawing upon the biological as well as the physical sciences. We believe that the richness of the scientific resources of our free society will be our greatest asset in this competition. We believe that we can win.

Having set for ourselves this goal, the indirect benefits to the American people, I am convinced, will be enormous. Many of these are not predictable at this time and their worth cannot be calculated, but some are clearly

foreseeable. The goal of commencing manned exploration of the moon before the end of this decade will cause us to accelerate to the maximum pace our entire research and development effort in space technology. Calling, as it does, on the most diverse resources in our economy, it is bound to result in a great variety of new consumer goods and industrial processes that will raise our standard of living and return tremendous benefits to us in almost every aspect of our national life.

The forward movement of space technology, with its many ramifications in our industrial life, will stimulate our economy just as other great technological developments such as the railroads, electricity, the automobile, and aviation have done in the past.

Already more than 3,000 space-related products have been developed in the United States. Miniature electronic parts devised to save weight in rockets and their payloads are now being used in tiny hearing aids, medical equipment, midget radios, portable television sets, and the like. Into other consumer goods are going new materials, alloys, plastics, fabrics, and compounds of many kinds originally created to do space jobs. In fact, the nation's space

program is drawing upon and stimulating practically the entire industrial spectrum -- electronics, metals, fuels, ceramics, machinery, instruments, textiles -- in addition to a wide variety of private and university research facilities.

Although our space program is ordinarily thought of in scientific and engineering terms, it is posing problems which tax the ingenuity of lawyers both in and out of Government.

Let us take the field of communication satellites as an example. The entire communications industry is convinced that communication satellites present an enormous potential for increasing our long-distance communications resources. In the telephone and telegraph areas alone, there appears to be unanimity in the industry that satellite communications will provide a more economical means than new submarine cables for meeting the greatly increased demands for transoceanic services which can be anticipated during the coming decade. For the first time, world-wide television becomes foreseeable; and entirely new forms of global communications, such as closed-circuit TV on an international basis, are made possible.

The use of satellites for communications is the outstanding example of a practical application of space technology, which, from a policy point of view, may be said to have begun in space and ended up on earth, instead of the other way around. The technology of communication satellites is a product of our space exploration program. But the national policy for its use, as enunciated by the President on July 24th and by the Federal Communications Commission on July 25th, is a very earthly product.

That the public policy problems of communication satellites are complex is unquestioned. They stem basically from the fact that space technology up to the present time has been developed by government initiative with public funds, while communication services in this country are supplied to the public by carriers which are privately owned and publicly regulated. The utilization of satellites for communications also involves foreign communications organizations. Indeed, it has potentially a global impact. Thus, a variety of governmental and commercial interests are all woven into the problem of achieving an orderly transition from research and development to the operation of a complete system.

To accomplish this transition, clear objectives needed to be identified and effective actions and procedures undertaken for attaining them.

The objectives, I believe, have been admirably set. The President's statement of July 24th affirms as a national goal the establishment of an operational communication satellite system, which can grow to global proportions, at the earliest practicable time. It favors private ownership and operation and identifies specifically the public interests in that activity which must be safeguarded. It directs the agencies of government to perform certain functions in addition to the regulatory responsibilities of government. All of this is conceived as the best way to maximize the effort toward a great global achievement which this country has set for itself. The actions and procedures aimed at the earliest transition to a truly practical application of communication satellites have been initiated with care and imagination.

As a technical matter, NASA is funding two active satellite projects, one in the low orbit field and one in the high, 24-hour synchronous orbit field, and is continuing the development and improvement of the Echo-type

passive satellite. NASA is also engaged in a cooperative project with American Telephone and Telegraph Company, to experiment with a low orbit satellite, which involves for the first time in the three years of space exploration the channeling of a substantial amount of private capital into the achievement of a national goal. Under our agreement with AT&T, NASA will launch AT&T's experimental satellites into orbit and will provide tracking, data acquisition, and communication services, for all of which it will be reimbursed by AT&T.

As an organizational matter, the Federal Communications Commission, working in close coordination with the Department of Justice, has established a planning group made up of the present international communication carriers. This group is currently engaged in developing a proposal which will spell out the form of corporate organization, and its mode of operation, for integrating communication satellites into existing world-wide communications networks, and for fully satisfying the various public interests in that activity. Eventually, the Federal Communications Commission will review the carriers' proposal, along with other proposals before it, and take the steps necessary to

mold an organization best suited to provide the public with communications services of all kinds using satellite relays. Whatever the form of the organization may be, NASA expects to be able to provide it with the necessary space-tools to do the job.

As I said earlier, communication satellites are an outstanding example of the application of space technology to practical earthly purposes. Also, they provide an outstanding example of the need for imaginative thinking if all the relevant interests are to be accommodated and our national goal achieved. It is a field in which lawyers are bound to play a significant role.

Innovation is characteristic of many areas of NASA's work outside of the scientific and technical fields where it would naturally be expected. To accomplish its research and development mission, NASA has found it desirable to create new techniques for project management and to arrange for industry participation with the Government on a team basis. For example, to ensure that the responsibilities of both NASA and the AEC in applying nuclear energy to space activities are properly fulfilled, it has been apparent for some time that a joint effort would be necessary.

Accordingly, an agreement has been worked out between the two agencies concerning the development of space nuclear rocket propulsion. This agreement defines general areas of agency responsibility, leaving to each agency those areas for which it must be responsible under governing law. To assure that the authority of each agency is properly exercised, we have established a joint AEC-NASA office, combining NASA and AEC personnel, to direct the Project. This joint office has been delegated contracting authority both by the AEC and NASA.

Recently the first contract, one which will be funded jointly, was awarded by the AEC-NASA joint office for the first phase of work looking to the development of a nuclear rocket -- a project called "NERVA." This contract is somewhat unusual in that it contemplates the close cooperation in technical areas of two of this country's largest corporate enterprises at a high corporate level. The Aerojet-General Corporation, as prime contractor, has full responsibility for the performance of all work under the contract. Its capabilities, however, are supplemented by the services of Westinghouse Electric Corporation as nuclear subcontractor. Westinghouse is

responsible to the prime contractor for the reactor and reactor control system portions of the engine. To achieve close coordination, the Aerojet-General Corporation has established a Nerva Operations Director to whom not only Aerojet's employees will report on technical matters but also the Westinghouse scientific project management. In addition, an advisory group, consisting of top scientific and engineering personnel of both corporations and the Government, will serve as an informal advisory group to Aerojet's Nerva Operations Director.

While the usual contractor responsibilities may seem to be somewhat blurred by arrangements which bring together both contractor personnel and Government representatives in a working group, we hope that these arrangements will facilitate an exchange of know-how which will make possible more rapid developments in a new technology and even contribute to scientific breakthroughs.

Another example of a rather unique type of contractual arrangement which NASA has entered into is its contract with the California Institute of Technology. Under this contract, the Jet Propulsion Laboratory, which is a part

of the California Institute of Technology, occupies and operates the Government facilities located at Pasadena, California, which were transferred to NASA from the Army by Executive Order in December, 1958. Through a task order procedure, NASA calls upon the Laboratory to carry out agreed-upon projects relating to exploration of the moon and its environment and of the planets and interplanetary space by means of unmanned spacecraft.

The distinctive aspect of NASA's relationship with this contractor is that, in spite of this contractual arrangement, the Jet Propulsion Laboratory is treated in many ways as one of NASA's Space Flight Centers. It is, under contract, conducting a vital portion of the NASA program in much the same way as are NASA's own Centers. Under the Surveyor Program, which involves the development of equipment for a "soft" landing of an unmanned spacecraft on the moon, most of the work will be done by industry under subcontract to JPL; and NASA is looking to JPL to provide the type of technical monitoring of the industrial effort that a NASA Center typically provides, subject, of course, to the overall technical direction of NASA.

Moreover, the top managers of JPL are treated in many ways like the top managers of the NASA centers. They attend our top management conferences as equals, and contribute to, and participate in, our major policy discussions. Such a relationship is, of course, facilitated by the fact that JPL, as part of the California Institute of Technology, is a nonprofit organization.

Man's new-found ability to explore space is also creating new problems of an international legal nature. You will recall that the United Nations Ad Hoc Committee on the Peaceful Uses of Outer Space made a preliminary examination of some of these problems in 1959; and in December of that year, the United Nations General Assembly passed a resolution establishing a new committee to continue investigation of these matters. Unfortunately, this committee has never met.

Lawyers will undoubtedly be concerned far into the future with problems of international organization and control relating to this vast new dimension of human activity. Whatever man does, wherever he goes, he needs the ordering influence of law; and it is the duty and the

privilege of the lawyer to be the architect of the means by which cooperation can be advanced and conflict reduced. The field of space exploration belongs not only to the scientist and engineer, but to the lawyer as well.